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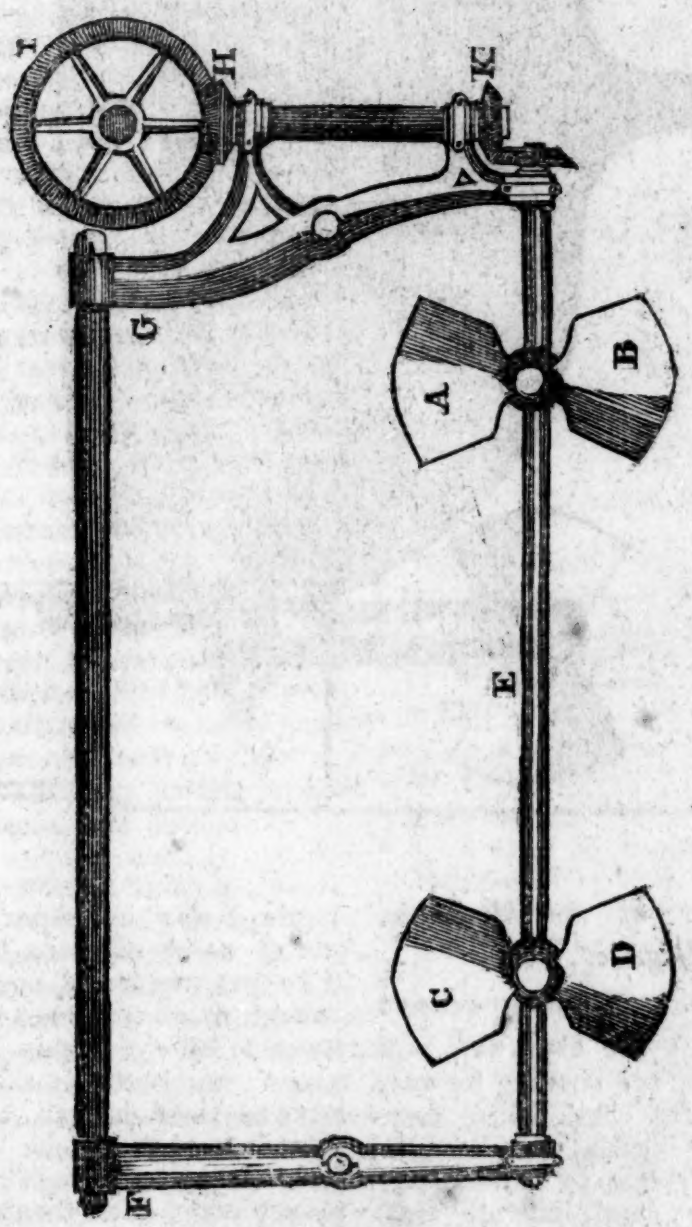
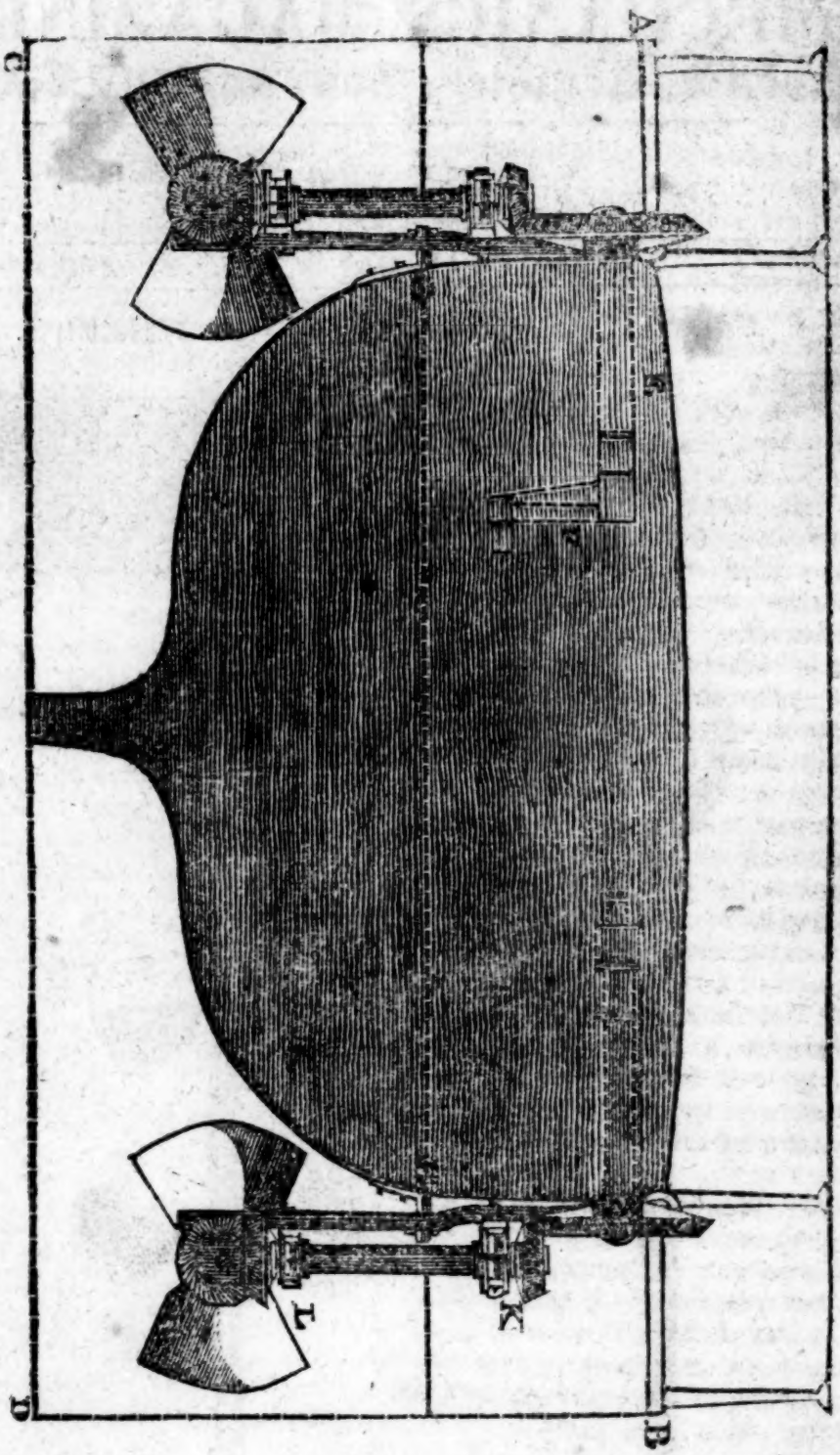
Museum, Register, Journal and Gazette.

Come, bright Improvement! on the car of Time,
And rule the spacious world from clime to clime;
Thy handmaid Arts shall every wild explore,
Trace every wave, and culture every shore.——*Campbell.*

VOL. I.—No. 17.] SATURDAY, MAY 28, 1825. [Price $4 PER ANN.

SWAN'S ROTATIVE SCULLING WHEELS.





To the Editor of the Mechanics' Register.

50 BROAD-STREET.

SIR,—Amidst the eagerness with which the public are rushing forward to form plans for establishing communications by means of rail-roads, the old conveyance by canals is almost forgotten; and, indeed, from the prospect of gain and celerity displayed by the projectors of these roads, it way be expected that the aid of water will soon be discarded. The proprietors of some canals, although much disposed to be supine, have I believe begun to take the alarm; and probably all will become alive to their danger, when bills are presented to the House of Commons for forming rail-roads; acting as is too often the case, for the defence of their own property, by opposing the plans of the incipient speculators.—

Judging from the liberal spirit lately displayed by parliament, I am inclined to suspect that they will not allow private interest to arrest the march of improvement, but that they will permit rail-roads to be attempted in all directions, even if obviously in the way of older establishments, leaving it to the efforts of the competitors to prove with which plan the superiority rests.

Presuming then that the canal proprietors will be compelled to sustain a competition, I wish to suggest to them a mode by which their movements, more fit for the torpor of past ages than the enterprise of the present period, may be accelerated; and as they do possess some advantages over their opponents, the suggestion which I am about to make may, if properly applied, preserve for them a superiority, which otherwise they could not maintain.

It is not necessary here to remark, that the use of steam constitutes the distinguishing feature of modern improvements. This power has in some degree superseded the use of wind in navigation, and of wind and water as the prime movers of machinery. It is now nearly ready to supersede the use of horses upon our roads; at least hydrogen, one of the constituents of steam, is about to do so; and if it be not also found in place of horses as the impeller of barges upon our canals, inland navigation must soon be discarded. To drag several barges in succession by a steam boat, is a plan which I have no doubt has occurred to many when thinking upon this subject; but the inconvenience of the paddle wheels generally used, and especially the injury done by them and the agitated water to the banks, which are necessarily very near to the barge, have appeared insuperable difficulties. In general steam navigation, I have always considered the paddle wheel the most imperfect and objectionable part of the arrangement. The manner in which it strikes the water is attended with loss of power; it is dangerous if approached by small boats, on account of the swell which it occasions; and in a stormy sea or river, it appears to be ill adapted to continuing the motion or resisting the waves which dash against the vessel. Thus impressed with the necessity of improving the method of propelling vessels by steam, I was much gratified by receiving an invitation to be present at the exhibition of a new and improved mode, by way of experiment, on a sheet of water in the grounds of Charles Gordon, Esq. of Dulwich Hill. This experiment, conducted by the inventor, who is in the employ of Messrs. Gordons, at Deptford, I had lately the pleasure of witnessing; and the result was so satisfactory, that I am anxious to direct the attention of engineers in particular to it. The velocity and steadiness of the motion so far exceeded that of the same model when impelled by paddle wheels moved by the same spring which worked the new contrivance, that I could not doubt of its superiority; and the stillness of the surrounding water was such as to give to the vessel the appearance of being moved by some magical power. In a comparative experiment made by the ingenious and modest inventor, and frequently repeated, it appeared that the velocities of the model, impelled according to the old mode and the new spring, by the same was as seventeen to twenty.

Before describing the sketch which I have transmitted with this letter, I will insert the account of his plan which I received from the inventor.

To Dr. Birkbeck

Honoured Sir,

According to your request, I send you my remarks on the Rotative Sculling Wheels for propelling vessels. First, I would notice their compactness, in not occupying more than one fourth part of the space the common wheels do. As seen in the plan, they may lay in harbour with other vessels, without any danger of being injured at all, which is at present a great inconveniency. Secondly, the superior advantage in a rough sea, in which they act the same as in a calm pool, being entirely beneath, in the solid, dense water; and besides, their weight, from their situation, as will plainly appear, will be as ballast in the hold, an object at sea

worthy of consideration. Thirdly, from their situation beneath the surface, they are not liable to be impeded by floats of ice, or by storms; therefore, I think they might be suitable to packets for despatch, and might be used all the winter.—Fourthly, they make no swell or commotion, either disagreeable, or dangerous, in the water, as the common wheels do when lighting in a fermentation of air and water; but go as smoothly as a vessel under sail—their action being in the solid water as a lever upon a rock for a fulcrum.

I shall decline saying any more at present upon the principle, and leave it, sir, to your very superior judgment to comment upon. The apparatus has been shown several times to some gentlemen of the first respectability and genius, both mechanical and nautical, and has constantly met with the highest approbation.

I remain, &c.

JOHN SWAN.

35 Deptford-Green,
Sept. 28, 1824.

Description of the Engraving.

On the axis E. fig. 1, supported by the frame work, F, G, are placed the vanes, A, B, and C, D, having a surface equal to that of the floats of the paddle wheels, which are immersed whilst acting: these are so situated with respect to each other, that whilst working they act as a screw within the water, and thus draw the vessel forward. The angle which these planes make with their axis is about 30°. At H is seen the end of the crank, on which the wheel I is fixed to convey the motion of the engine through the train K, H, I. This machinery, however, is merely a suggestion; and probably a better and more simple mode might be devised for producing the requisite motion. The convenient manner in which this plan adapts itself to the vessel is observable in the end view, fig. 2, where it may be seen to lie entirely beneath that part of the deck which extends from A, to B. The dotted lines represent the axes within the vessel, on which the wheels, I, I, fig. 1, belonging to each side are fixed; and F, in the same figure, shows the crank on one side. G and H represent strong bolts, by which the whole apparatus is attached to the vessel, affording a very ready method of disengaging them, whenever circumstances may require such separation.

If by this description of what seems to be an excellent contrivance I should be so fortunate as to obtain for the inventor the notice of any competent practical man, so that it might be applied in actual steam navigation, or if it tend when introduced to relieve the canal proprietors from the difficulty into which they are likely to fall, it would be found to justify the favourable opinion of it now entertained by

Yours, truly,
G. BIRKBECK.

Jan. 18, 1825.

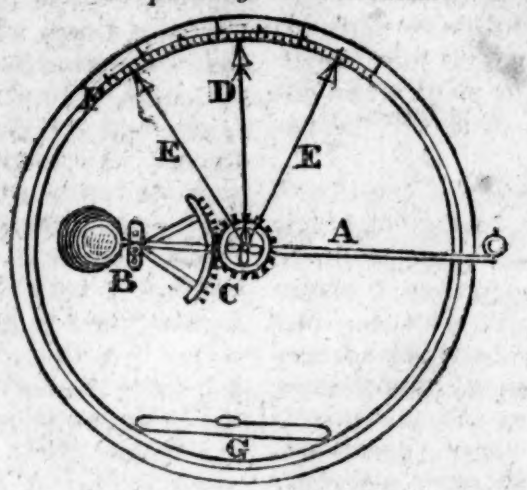
THE JEWELRY TRADE.

We are informed that one of the first measures of the ensuing session of Parliament will be the regulation of a standard for all articles manufactured from gold. Such a measure as this has long been wanted, to protect the public from the unfair dealer, and also the reputation of the honest jeweller from the suspicion which attaches to the trade but too generally. It is, indeed, almost incredible, that whilst the Legislature should have fixed the standard of plate, and of certain articles, such as watch cases, &c. it should have left no other barrier to imposition in the more numerous and expensive articles of jewelry, than the conscience of the manufacturer. At present, no man who purchases a gold seal or a chain, or any small article of jewelry has the slightest satisfaction on the score of its intrinsic value; whereas, in other countries, the smallest article is stamped by a government officer. In France, for instance, when a person purchases a new article of jewelry, he can throw his old gold into the scale of the jeweller, and insist upon his weighing it against Napoleons, the sterling coin of the country, and allowing its full value. When the purchase of a gold chain is made in Paris, its weight is charged first, and the fashion afterwards, so that its intrinsic value may be fairly ascertained. So just a mode of protecting the public cannot be too warmly praised, or the example too speedily be followed.

Mechanics' Register.

SELF-REGISTERING THERMOMETER.

Proposed by E. CLARK.



Description.

A represents the Thermometer.
B, its fulcrum, or point of suspension.
C, pinion work to increase the motion of the index.
D, main index.
EE, registering indices.
F, scale.
G, level to adjust the instrument.

To obtain a good instrument, by which the greatest dilatation and contraction of liquids or fluids used as measures of sensible caloric can be ascertained without the attendance of an observer, and by which the intermediate changes can also be determined, has, particularly as connected with meteorological studies, been considered of some consequence, and attracted the attention of ingenious men, as well as learned societies.

Those at present in use, the result of a pretty thorough investigation of the subject, are as perfect, perhaps, as human skill and art will allow; but as adding to the variety of modes by which similar ends may be obtained, the foregoing is proposed for the consideration of the curious. The large bulb and tube of this thermometer are to be filled with mercury, so that when suspended on its fulcrum the expansion and contraction of the metal shall altogether take place in the small bulb, which is shown without the scale in the above diagram. Some attention will be necessary in graduating it, particularly on account of its form and dependant movements; but as the expansion and contraction is only sensible at one point, if the apparatus be large, it will indicate the changes of temperature with at least as great accuracy as those in which a liquid constitutes the index, by moving through the variable calibre of glass tubes, more especially as such for registering purposes require to be of comparatively large dimensions.

The freezing and boiling points may be obtained by placing the Thermometer scale and all in water of the requisite temperature. These ascertained, and the fulcrum moving easily on the rests of the fork, it is evident that the gravitating centre of the Thermometer will constantly and regularly change its position with the change of temperature in the surrounding media, and cause the bulbs to describe arcs of a greater or less number of degrees, according to the increment or decrement of temperature, the relative weights of the two bulbs, and their proximities to the fulcrum.

The apparatus constructed with a single index, will answer all the purposes of a common thermometer, and if two others furnished with small stops or pins, be added, so as to be operated on by it, in both its moving directions, they will indicate the greatest daily or other periodical changes of temperature, provided they be set for the purpose. Allow-

ance, however, must be made for the inconsiderable resistance of their motion, which may at any time be measured by noticing where the main index rests, when free, and how much it falls short of that point when obstructed by the resistance of the registering indices.

This Thermometer will require to be adjusted by an appendant level, or by turning the scale so as to make it correspond with another thermometer, known to agree with it. The freezing point should be adjusted very little below a horizontal line passing through the fulcrum.

Barometers may also be constructed to operate on the same principle that governs the movements of the before described Thermometer.

Both the above instruments may be made very minute and accurate measures for determining the elevation of mountains, hills, or any less height; for their structure admits of the use of any quantity of mercury that may be necessary to obtain a clock-work movement, that shall indicate the difference in altitude of a single foot. The resistance of friction may be accurately ascertained, and the operations of the instrument so insulated, and the calculations so simplified, that almost any individual possessed of vision may use it. By those now in use, approximations to facts can only be expected, because of the convexity of the mercury in the tubes, and the great nicety that their management requires; besides, they are exceedingly liable to be broken or injured, which need not be the case with those above, for the tube may be made of iron, which, while travelling, should be detached from the clock-work apparatus.

STEAM GUNS.

We stated, in a former Number, that the French had laid claim to the merit due to Mr. Perkins's invention for firing balls by steam; and explained, at the time, the difference which really existed between his invention, and that which was submitted to the French government. We now find that the idle claim of priority which was set up has been abandoned, and that the French have really turned their attention to putting into practice the plan submitted to them many years ago for discharging water by steam. An engine or gun for this purpose is now fitting up at the steam engine manufactory at Challot, near Paris, and will be ready for public exhibition very shortly. This engine is calculated to throw several tons of water in a minute, and is intended as a fixture on fortifications, to enable the besieged to overwhelm the besiegers within their lines. At present we believe, it is not the intention of the French government to apply it to any other purpose; although a report has been made upon it, in which it is stated, that it may be applied with effect to ships, so as to deluge an adversary during a broadside.—Should a war break out, which Heaven avert, there cannot be a doubt that these terrific engines will be adopted by the French government to a considerable extent; and we, therefore, put it to our ministers, whether they ought not instantly to order a report to be made on the subject, so that, in so calamitous an event, they might be able, without loss of time, to prepare for the worst—or, in the words of American Jonathan, to give the French a dose of cayenne in return for common pepper. It is an extraordinary fact, that in the ports of Brest and Bordeaux, six steam vessels are building of an extraordinary size, the engines of which are to be on a peculiar principle—what this principle is we are not told; but is it not highly probable that the discharge of water from the sides of the vessel is to form a leading feature in the construction. Now let us see what may result from all this:—The French, during a period of profound peace, build steam vessels, which they use in the way of commerce; these vessels, however, are so constructed, that in the event of a war, they have only to put in cannons, and apply the principle of the engine in the way in which we have stated, and they produce enormous

floating batteries which nothing can resist. We will imagine a fleet of steam boats sailing for the English coast, profiting by a calm, when the wooden walls of old England cannot act, or proceeding with enormous speed boldly by our vessels, into which they throw tons upon tons of water, deluging the decks, and preventing the men on board from working the guns; then attacking open and defenceless towns with shells or cannon, and turning back with impunity. Now there is nothing visionary in all this—it is perfectly practicable, and will be practised—*the French are preparing for it even now!* With honied words of peace in their mouths, they have war in their hearts, and are silently laying a train which may explode with an effect the more violent, as it was the less expected. Let it not be said again, as it has been long foolishly said, that the French will be years and years before they can attain sufficient mechanical power for all this; whereas, England, in a few weeks, could do all that is necessary. Is there not at this moment in Paris alone, a steam engine manufactory, with 250 men (all Frenchmen except two, the active partner and the foreman) in full activity? And has not this manufactory alone, in less than two years, turned out upwards of 400 steam engines? Let us hear no more, therefore, of the inability of the French nation to put into execution their project of steam war vessels; but, like a wise nation, prepare for them at once, by devoting all our energies to a preparation which would avert war. If the French find us so preparing, they will be careful how they begin; but if we sleep at our post, we shall wake one day in alarm, and find that the frog-eaters are not so contemptible as we conceived them to be.

Mechanics' Register.

TO CLEAN PICTURES.

Water is the first material, and of the most general use in cleaning pictures.—This will remove many kinds of glutinous bodies and foulnesses; such as sugar, honey, glue, and many others; and it will also take off any varnish of gum Arabic, glair of eggs, or isinglass, and is therefore the greatest instrument in this work. It may be used without any caution with respect to the colours, as it will not in the least affect the oil which holds them together.

Olive oil, or butter, though not generally applied to this purpose, will remove many of those spots which resist even soap, as they will dissolve or corrode pitch, rosin, and similar bodies, they may be used very freely, having no bad effect on the painting. Pearl ashes, melted in water, make a proper dissolvant for most kinds of matters which foul paintings, but this must be used with great caution.—Spirit of wine, as it will dissolve all the gums, and gum rosins, (except gum Arabic) is very necessary for taking off picture varnishes composed of such substances; but it corrodes the oil of paintings, and softens them in such a manner as to render all rubbing dangerous while they are under its influence. Oil of turpentine will likewise dissolve some of the gums used for varnish; but spirits of wine will generally answer the purpose much better. When paintings appear to have been varnished with those substances that will not dissolve in water, they are very easily and safely removed by the following method, viz.

Place your picture, or painting, in a horizontal position, and moisten, or rather flood the surface of it with strong rectified spirits of wine; but all rubbing, beyond what is absolutely necessary, must be avoided. Keep the painting moist, by adding fresh spirit, if requisite, for some minutes, then flood the surface copiously with cold water, with which the spirit, and such part of the varnish as it has dissolved, may be washed off; but in this state of it, all friction must be avoided.—When the painting is dry, the operation may be repeated, until the whole varnish is removed.

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PREPARATION OF GINGER BEER POWDERS.

Take two drachms of fine loaf sugar, eight grains of ginger, and 26 grains of carbonate of potash (all in fine powder;) mix them intimately in a Wedgewood's ware mortar. Take also 27 grains of ci-

tric or tartaric acid (the first is the pleasantest, but the last the cheapest.) The acid is to be kept separate from the mixture. The Beer is prepared from the powders thus:—Take two tumbler glasses, each half filled with water; stir up the compound powder in one of them, and the acid powder in the other; then mix the two liquors. An effervescence takes place—the beer is prepared, and may be drank off. It must be drank off directly, or it will become flat.

PRESSURE AND RAREFACTION OF THE AIR.

The pressure of the air, and its rarefaction by heat, are excellently illustrated by the following simple experiment:—Take hold of a wine glass with your right hand, and with your left put into it a small piece of burning paper. When the paper has burned for a few seconds, strike the mouth of the glass against the palm of your left hand, and it will remain firmly fixed to it for a considerable time. The cause of this is, that the internal air is so rarefied by the burning paper, that the pressure upon the inside of the glass is greatly diminished. The equilibrium, therefore, of the pressures upon the outside and inside of the glass being destroyed, the glass must adhere to the hand till that equilibrium is restored.

SINGULAR OPTICAL DECEPTION.

When the wheel of a carriage in motion is attentively viewed through vertical bars, such as the rails of a pallisade, or the laths of a Venetian blind, the spokes appear to bend downwards, and more or less so as they are situated farther from or nearer to the spoke which happens to be vertical, and which always appears to be perfectly straight. Dr. Mark Roget, in a paper which he has addressed on the subject to the Royal Society, explains this curious phenomenon by supposing that the impression made on the retina by a pencil of rays, when sufficiently vivid, continues for some time after the cause has ceased. He thinks it even possible to estimate the actual duration of any impression on that organ, from the apparent velocity of the spokes.

IMPORTANT INVENTION.

A person of the name of Roberts, who is at present in Bolton, has constructed an apparatus which will prove useful and valuable in the highest degree. Its object is the safety of life and property, in cases of fire, or where any suffocating or noxious vapour exists. It consists of a hood and mouth-piece, so contrived as to render the wearer enabled to breathe with perfect ease and safety in the midst of the densest smoke. In case of dwelling houses, warehouses, factories, ships at sea, &c. being on fire, its advantages are incalculable. Roberts exhibited the efficacy of the above extraordinary discovery at the mines of the Earl of Balcarras, a few weeks since, to the complete satisfaction of those who witnessed it. On Wednesday week, at the recommendation of several persons in Bolton and the neighbourhood, of the highest respectability, he invited some of the principal tradesmen and inhabitants of the town to meet him at Messrs. Crook and Dean's Foundry, Little Bolton; where he demonstrated the infallibility of his apparatus, to the utter astonishment of a very respectable party of gentlemen. In the course of the trial, he went into a stove room, in which sulphur, hay, &c. were burning at the same time. He was shut in for the space of 20 minutes, and came out at the expiration of that time perfectly sound and uninjured. Had any one, without the apparatus, remained in the room longer than a minute, it would have been attended with certain death. The invention will be submitted to the Society for the encouragement of Arts and Sciences. He has been advised by some to apply for a patent; but like all who are possessed of true genius, he is modest and unobtrusive: and consequently abhors quackery, or even the appearance of it. He prefers allowing the public the full benefit of his exertions, and trusting to their benevolence, as the reward of his labours. We understand that some gentlemen are endeavouring to raise a subscription for him.

Mechanics' Register.

BOMB CANNON.

"Mr. Paixham (a Frenchman) has invented a mortar which throws bombs horizontally, exactly in the same manner that cannon discharge balls. This bomb cannon, executed under the orders of the Marquis de Clermont Tonnerre, was lately proved at Brest. It answered every expectation, and carried as far as the largest ship guns. The bomb went true to the direction, and the effect produced was so powerful, that considerable changes are immediately to be made in the naval *materiel*. In consequence of this new inven

tion, large ships will no longer have the advantage of crushing smaller vessels without running any risk. A well directed discharge of one of these bombs may blow up or sink the largest ship."

It is surprising that in a period of profound peace, Sovereigns, instead of offering premiums for those improvements in science which are honourable to humanity, should evince so much anxiety to promote mutual destruction.

Mechanics' Register.

LOCOMOTIVE STEAM ENGINES.

We have seen it stated in several of the Papers, that the use of locomotive engines upon rail roads was never likely to become general, as all the experiments which had been made with them had been attended with failure. We suspect that these statements had their origin in a quarter whence they might naturally be expected; for it is not probable that so positive a falsehood would be the result of mere error. That locomotive engines are not capable of performing all that has been promised in some of the Prospectuses for new rail roads, we are very ready to admit, nor would we indeed wish to be whirled along at the rate of twenty miles an hour; but that they are an important improvement in science, and in the application of human means to the great purposes of commerce, cannot, we think, be denied by any, except those whose interest is directly opposed to the adoption of them.

The following account of an experiment made with a locomotive engine at Killingworth Colliery, near Newcastle-upon-Tyne, will be found interesting.—In this account we have, indeed, no statement to astonish, but much to gratify the man of science, who is aware how much may be done in the way of improvement upon a novel invention. Yet if we look at the great weight drawn by this engine, and at the very small expense attending it, we shall have good reason to contend, that with less burthen, and more fuel, a great part of what has been promised by the projectors of locomotive carriages for the conveyance of passengers, will be realized. We repeat that we do not wish to travel at the rate of twenty miles an hour; but if we can go at the rate of ten without the danger of having our necks broken, or the insolence of coachmen, or the annoyance of dust and mud, and, what is more than all, the distress to that noblest of the brute creation, the horse, we shall bless the labours of steam carriage projectors.

"A grand experiment as to the power of locomotive engines, was performed at the desire and in the presence of more than twelve gentlemen from the Committees of the intended Manchester and Liverpool, and Birmingham and Liverpool Rail-Road Companies, at Killingworth Colliery, and the result was as follows:

"The engine, being one of eight horse power, and weighing with the tender (containing coals and water) five tons and ten hundred weight, was placed on a portion of rail-road, the inclination of which in one mile and a quarter was stated by the proprietor, Mr. Wood, to be one inch in a chain, or one part in 792; twelve wagons were placed on the rail-road, each containing two tons and between thirteen and fourteen hundred weight of coals, making a total useful weight of thirty-two tons and eight hundred weight. The twelve wagons were drawn one mile and a quarter each way, making two miles and a half in the whole, in forty minutes, or at the rate of 3 3-4 miles per hour; consuming four pecks and a half of coals. Eight wagons were then drawn the same distance in 36 minutes, consuming four pecks of coals; and six wagons were drawn over the same ground in 32 minutes, consuming five pecks of coals."

We had sent the above to our printer, before we learned that the very paragraph which we have quoted as illustrative of the importance of locomotive engines, had been inserted in the newspapers by the Canal interest, and regulgrly paid for to the proprietors, with the view to oppose the Rail-road Bills in the House of Commons. It is remarkable that what these gentlemen consider as conclusive against rail-road projects, appeared to us to be rather favourable; and we cannot refrain from doing them the justice to say, that they have inserted the facts without any unfair comment. We have since ascertained from one of the leading men interested in the opposition to rail-roads, that if the weight to be drawn be reduced the engines will travel at the rate of 12 miles an hour, and the only obstacle to be apprehended would be the carriages falling off the railway, a danger which we conceive can only exist in the imagination of the Canal interest. Thus the practicability of steam carriages for the conveyance of passengers is fully established, and we have as little doubt that the conveyance of goods at the rate of seven or eight miles an hour, will soon be as easily accomplished.

GINGER WINE.

The following valuable receipt is but little known, but will be found to be the best method of making this very cheap, pleasant, and salutary wine.—To every gallon of water put 2 lbs. of lump sugar, and one ounce and a half of grossly pounded ginger tied in a coarse linen bag.—Boil these together half an hour, or as long as any scum arises, which must be carefully skimmed off. Put this liquor, when sufficiently boiled, into a tub, and on its becoming of the warmth of new milk, add the juice and rinds of two lemons, and half a Seville orange for each gallon. If ten gallons be made, put in two table spoonsful of yeast on a bit of toasted bread. Should the wine be made in cold weather, it must be kept in a warm place, the better to promote fermentation, which sometimes does not take place for a day or two. If it ferments freely, tun it up the third day, ginger and rinds together, in a cask just calculated to hold it, keeping out a small portion for the purpose of filling up the cask while it continues to work, which must by no means be filled up with any part of what flows over.—When it has ceased fermenting, rack it off into another cask, adding to every four gallons a quart of the best brandy, with half an ounce of isinglass previously dissolved in some of the wine. In one month's time it will be fit to drink, or bottle; and few families, it will be presumed, who once make it, and experience its good effects, will ever after choose to be without a cordial wine at once so cheap and comfortable.

Mechanics' Register.

ORANGE WINE.

To ten gallons of water, put 28lbs. of loaf sugar, and the whites of six eggs,—boil them together for three quarters of an hour, keeping the liquor well scummed all the time, and pour it hot into a tub or large pan, over the peels of fifty oranges. When it is nearly cold, take three spoonsful of yeast spread over a piece of toasted bread, and put into the liquor to make it ferment. After it has stood two or three days, pour it from the peels into a cask with a gallon of orange juice; let it remain in the cask until done hissing, when the fermentation will have ceased. Endeavour to proportion the size of the cask to the quantity, as it must be kept filled, so as to work out at the bung hole. When the fermentation is over, draw off as much of the wine as will admit one quart of brandy for every five gallons of wine. It will be fit to bottle off, or drink from the cask, in four or five months. This wine, if carefully made, according to these plain directions, will be found exquisitely delicious, and if kept four or five years, would be found to surpass most of the best foreign wines as they are usually sold in England.

Mechanics' Register.

INFLUENCE OF TEMPERATURE ON STONE BRIDGES.

M. Vicat has had occasion to observe a striking instance of the effect of change of temperature on a bridge constructed over the Dordogne, at Souillac. The bridge was of stone; had seven arches, each of above twenty-four feet span. It was expected that, as the masonry settled, the parapet-stones would separate slightly from each other; and, in fact, this took place, but it occurred suddenly and precisely, during the very cold weather of February, 1824. Continuing the observation of what took place at the separation thus formed, it was found that the cement with which the portions of the cracks had been filled, remained undisturbed during the cold weather; but that as the warm weather came on, it was pressed out, and the joints were closed; and it was ultimately ascertained, that much of the expansion and contraction of the bridge was entirely thermometrical, depending upon the changes of temperature communicated to it by the atmosphere.

One of the most important and evident consequences of this action is, that large arches, exposed to the variations of natural temperature, are never in equilibrium; and M. Vicat remarks, that these effects are equally produced, and have been observed in arches constructed more than a year previous, and in those which have not been built more than two moths; so that the thermometrical expansion and contraction of the stones does not appear to change by time.

TO MEASURE THE CONTENTS OF PIPES.

Square the diameter of the pipe in inches, and the product will be the number of lbs. of water, avoirdupois, contained in every yard's length of the pipe. If the last figure of this product be cut off or considered as a decimal, the remaining figures will give the number of ale gallons

in a yard's length of the pipe; and if the product consist only of one figure, this figure will be the tenths of an ale gallon.—The number of ale gallons, divided by 282, will give the number of cubic inches in every three feet of the pipe, and the contents of a pipe of greater or less length may be found by proportion.

GAS EXPLOSION.

The account of the Newspaper states, that

"Mr. Grafton, an engineer, was called upon for his explanation of the cause of the late accidents from gas which have occurred in London.—Upon this subject, as well as upon the case of the general impurity of the light, Mr. G's statement was certainly interesting and very satisfactory. He observed, that it was a matter of great surprise to him that more accidents had not happened, because the hurried and extremely unskilful manner in which the work had been executed in many places, had caused a constant leakage from the pipes.—From this cause alone, the loss of gas in the streets of London would light a considerable town; and yet, under an escape so extraordinary, and the carelesness to which the immense number of lights were subject (distributed, as they are, in the metropolis by pipes extending for several hundred miles and producing to the Companies a revenue of 200,000*l.*,) still not more than six or eight accidents from explosion could be enumerated, and those, it was important to know, had proceeded from the main or service pipe in the street, which might admit of a sufficient quantity of gas to escape to form an explosive mixture with the atmospheric air. But the proportions were so difficult to form, that it was not one time in a thousand that explosion could take place in any situation.

"If the least quantity of gas escaped more than was necessary to form the precise proportion for an explosive mixture, and a lighted candle was brought to it, the simple ignition could only take place; on the contrary, if the least excess of atmospheric air prevailed, either there would be the same result without explosion, or no combustion: hence an accident from its escape at the burners, when the gas was not turned off, had never been heard of. Shops and apartments of dwelling-houses were not sufficiently close to keep the gas confined; but supposing that they were, the quantity emitted would never be sufficient to form an explosive atmosphere. Take a room, for example, of twelve feet each way, containing 1728 feet, with a burner emitting gas at the rate of five cubic feet per hour, which was the largest size that could be used, and allowing there was no loss of gas to form an explosive mixture in the apartment, the burner must be left open upwards of fifty hours, or at least two days and nights, which was not likely to happen. Mr. Grafton observed, he had no hesitation in saying, that if in this manner, for the sake of experiment, the gas in all the shops in London were allowed to escape (by the blowing out of the flames without stopping the cock,) and a lighted candle were brought into any of the rooms, at any hour of the night, an explosion could not take place; assuming, of course, that every house had its ordinary ventillation.

"In speaking of the few accidents which have occurred, it was to be remarked, that the extent of pipes in the metropolis formed but a small part of the whole of what were used for thus conveying gas; there are more than one hundred towns already lighted; and the range of pipe, inclusive of what is used within the manufactories, might be computed at upwards of 10,000 miles.

"If the burning of gas had ever been deemed dangerous by its first promoters, particular instructions would have been given to prevent its escape; but the consumer had received no caution on this head; it had been left, as regarded the shutting out of the lights, entirely to his discretion. Great neglect had been the consequence; but Mr. Grafton believed, that not a single accident could be pointed out as having arisen from it. He was aware that the late fires in some of the shops in London, as was generally the case, were attributed to the not turning off the

gas: this, for the reason stated, could not be true; some of the accidents might have occurred from the escape of gas, but it would be found that they had almost invariably proceeded from the main or service pipe. At the outset, old gun barrels were used as the best tubing which could then be had for the purpose; these were continually rusting away, and it was one of them which had occasioned a late accident, by the gas passing into a confined space in the shop through the channel of the earth in which the pipe was laid. Nothing could exceed the carelessness with which this work had been generally executed.

"With reference to the impurities of gas, it was an equally mistaken opinion that the smoke and effluvia which in too many instances discredit the light, was a natural result of its combustion, and could not be obviated. The cause of this complaint must be attributed to the indifference which had been generally shown on the subject: it was greatly neglected in all gas establishments and in several of them the gas was not even purified at all. But would it be believed that in some country towns more expense was bestowed on this essential part of the process than had been allowed at several of the greatest works in London. In those places, too, where the gas was pure, it was made offensive by the improper construction of the burner, and waste from burning; this it was easy to obviate, by properly regulating the pressure of the gas (which seemed to be very little understood,) and by the adoption of the meter.

"Had this state of things not occurred, oil gas would not have been known, and much of the valuable time would have been spared, which seems to have been employed in experiments to fix a scale of the comparative illuminating power of the two gases. That from oil had greatly the advantage in the comparison.—The works were all constructed by skilful and proper men; and the gas was generally made under the most favourable cirsumstances, while the best method for preparing coal gas had been in few instances understood, and no where sufficiently understood."

MEMIOR OF SIMPSON, THE MATHEMATICIAN.

The father of Thomas Simpson, one of the most eminent of English mathematicians, was a humble stuff-weaver, in the town of Market-Bosworth, in the county of Leicester, where young Thomas was born on the 20th of August, 1710. Intending to bring up his son to his own business, he took so little care of his education, that he was only taught to read English. But Nature had furnished him with talents, and a genius for far other pursuits, which led him afterwards to the highest rank in the mathematical and philosophical sciences.

Young Simpson very soon gave indications of his turn for study in general, by eagerly reading all the books he could meet with, teaching himself to write, and embracing every opportunity he could find of deriving knowledge from other persons. His father observing him thus to neglect his business, by spending his time in reading what he called useless books, and following similar pursuits, used all his endeavours to check such like proceedings, and to induce him to follow his profession with steadiness and better effect.—But after many struggles for this purpose the differences thus produced between them at length rose to such a height, that Simpson quitted his father's house entirely.

Upon this occasion he repaired to Nuneaton, a town at a small distance from Bosworth, where he went to lodge at the house of a tailor's widow, of the name of Swinfield, who had been left with two children, a daughter and a son, the latter of whom, who was about two years older than Simpson, had become his intimate friend and companion. And here he continued some time, working at his trade, and improving his knowledge by reading such books as he could procure.

Among several other circumstances, which, long before this, gave occasion to show Simpson's early

thirst for knowledge, as well as proving a fresh incitement to acquire it, was that of a large solar eclipse, which took place on the 11th of May, 1724. This phenomenon, so awful to many who are ignorant of the cause of it, struck the mind of young Simpson with a strong curiosity to discover the reason of it, and be able to predict the like surprising event. It was, however, several years before he could obtain his desire, which at length was gratified by the following accident:—After he had been some time at Mrs Swinfield's, at Nuneaton, a travelling pedlar came that way and took a lodging at the same house, according to his usual custom. This man, to his profession of itinerant merchant, had joined the more profitable one of a fortune teller, which he performed by means of judicial astrology. Every one knows with what regard persons of such a cast are treated by inhabitants of country villages; it cannot be surprising, therefore, that an untutored lad of nineteen should look upon this man as a prodigy, and regarding him in this light, should endeavour to ingratiate himself into his favour; in which he succeeded so well, that the sage was no less taken with the quick natural parts of his new acquaintance. The pedlar, intending a journey to Bristol fair, left in the hands of young Simpson an old edition of Cocker's Arithmetic, to which was subjoined a short appendix on Algebra, and a book upon Genitures, by partridge, the almanack-maker. These books he had perused to so good a purpose, during the absence of his friend, and to excite his amazement upon his return; in consequence of which he set himself about erecting a genethliacal figure, in order to a presage of Thoma's future fortune.

This position of the heavens having been maturely considered, *secundum artem*, the wizard, with great confidence, pronounced, that "within two years' time, Simpson would turn out a greater man than himself!"

In fact, our author profited so well by the encouragement and assistance of the pedlar, afforded him from time to time, when he occasionally came to Nuneaton, that by the advice of his friend, he at length made an open profession of casting nativities himself; from which, together with teaching an evening school, he derived a pretty pittance, so that he greatly neglected his weaving, to which indeed he had never manifested any great attachment, and soon became the oracle of Nuneaton, Bosworth, and the environs. Scarce a courtship advanced to a match, or a bargain to a sale, without previously consulting the infallible Simpson as to the consequences. But as to helping people to stolen goods, he always declared that above his skill; and over life and death he declared he had no power. All those called lawful questions he readily resolved, provided the persons were certain as to the horary data of the horoscope, and he has often declared with such success that if, from very urgent reasons, he had not been thoroughly convinced of the vain foundation and fallaciousness of his art, he never should have dropt it, as he afterwards found himself in conscience bound to do.

About this time he married the widow Swinfield, in whose house he lodged, though she was then almost old enough to be his grandmother.—After this, the family lived comfortably enough together for a short time; Simpson occasionally working at his business of a weaver in the day time, and teaching an evening school, or telling fortunes at night; the family being also farther assisted by the labours of young Swinfield, who had been brought up in the profession of his father.

But this tranquillity was soon interrupted, and Simpson driven at once from his home and the profession of astrology, by the following accident:—A young woman in the neighbourhood had long wished to hear or know something of her lover, who had been gone to sea; but Simpson had put her off from time to time, till the girl grew at last so importunate that he could deny her no longer. He asked her if she would be afraid if he should raise the devil, thinking to deter her; but she decla-

red she feared neither ghost nor devil; so he was obliged to comply. The scene of action pitched upon was a barn, and young Swinfield was to act the devil or ghost; who, being concealed under some straw in a corner of the barn, was, at a signal given, to rise slowly out from among the straw, with his face so marked that the girl might not know him.—Every thing being in order, the girl came at the time appointed; when Simpson, after cautioning her not to be afraid, began muttering some mystical words, and chalking round about them, till, on a signal given up rises the tailor, slow and solemn, to the great terror of the poor girl, who, before she had seen half his shoulders, fell into violent fits, crying out it was the very image of her lover; and the effect upon her was so dreadful, that it was thought either death or madness must be the consequence; so that poor Simpson was obliged immediately to abandon at once both his home and the profession of a conjuror.

Upon this occasion he fled to Derby, where he remained some two or three years, viz from 1733 to 1735 or 1736, instructing pupils in an evening school, and working at his trade by day.

It would seem that Simpson had an early turn for versifying, both from the circumstance of a song written here, in favour of the Cavendish family, on occasion of the parliamentary election at that place in the year 1733; and from his first two mathematical questions, that were published in the Ladies' Dairy, which were both in a set of verses not ill written for the occasion. These were printed in the Dairy for 1736, and therefore must at latest have been written in the year 1735. These two questions being at that time pretty difficult ones, show the great progress he had even then made in the mathematics; and from an expression in the first of them, viz. where he mentions his residence as being in latitude 52°, it appears he was not then come up to London though he must have done so very soon after.

Together with his astrology, he had very soon furnished himself with arithmetic, algebra, and geometry, sufficient to be qualified for looking into the Ladies' Dairy, (of which he had afterwards for several years the direction) by which he came to understand that there was a still higher branch of the mathematical knowledge than any he had yet been acquainted with, and this was the method of *Fluxions*. But our young analyst was quite at a loss to discover any English author who had written on the subject, except Mr. Hayes; and his work being a folio, and then pretty scarce, exceeded his abilityof purchasing. However, an acquaintance lent him Mr. Stone's *Fluxions*, which is a translation of the *Marquis de l' Hospital's Analyse des Infiniments Petits*. By this one book, and his own penetrating talents, he was enabled in a very few years to compose a much more accurate treatise on this subject than any that had before appeared in our language.

After he had quitted astrology and its emoluments, he was reduced to great straits for the subsistence of his family, while at Derby, and this determined him to repair to London, which he did in 1735 or 1736.

On his first coming to London, Mr. Simpson wrought for some time at his business in Spitalfields and taught mathematics at evenings, or any spare hours. His industry turned to so good account, that he returned down into the country, and brought up his wife and three children. The number of his scholars increasing, and his abilities becoming in some measure known to the public, he was encouraged to make proposals for publishing by subscription, "A New Treatise of Fluxions" being the first of his many valuable works.

When Mr. Simpson first proposed his intentions of publishing such a work he did not know of any English book, founded on the true principles of fluxions, that contained any thing material, especially the practical part; and though there had been some very curious things done by several learned and ingenious gentlemen, the principles were nevertheless left obscure and defective, and all

that had been done by any of them in *infinite series* very inconsiderable.

The book was published in quarto, in the year 1737, though the author had been frequently interrupted from furnishing the press so fast as he could have wished, through his unavoidable attention to his pupils for his immediate support. The principles of fluxions treated of in this work are demonstrated in a manner accurately true and genuine, not essentially different from that of their great inventor, being entirely expounded by finite quantities.

Through the interest and solicitations of William Jones, Esq. Mr. Simpson was, in 1743, appointed Professor of Mathematics, then vacant by the death of Mr. Derham, in the Royal Academy at Woolwich, his warrant bearing date August 25th: and in 1745 he was admitted a Fellow of the Royal Society. The President and Council, in consideration of his very moderate circumstances, were pleased to excuse his admission fees, and likewise his giving bond for the settled future payments.

At the Academy he exerted his faculty to the utmost in instructing the pupils who were the immediate objects of his duty, as well as others, whom the superior officers of the ordnance permitted to be boarded and lodged in his house. In his manner of teaching, he had a peculiar and happy address; a certain dignity and perspicuity, tempered with such a degree of mildness as engaged both the attention, friendship, and esteem of his scholars; of which the good of the service, as well as of the community, was a necessary consequence.

It must be acknowledged, however, that his mildness and easiness of temper, united with a more inactive state of mind, in the latter years of his life, rendered his services less useful; and the same very easy disposition, with an innocent unsuspecting simplicity and playfulness of mind, rendered him often the dupe of the little tricks of his pupils. Having discovered that he was fond of listening to little amusing stories, they took care to furnish themselves with a stock; so that, having neglected to learn their lessons perfectly, they would get round him in a crowd, and, instead of demonstrating a proposition, would amuse him with some comical story, at which he would laugh and shake very heartily, especially if it were tinctured with somewhat of the ludicrous or smutty; by which device they would contrive imperceptibly to wear out the hours allotted for instruction, and so avoid the trouble of learning and repeating their lesson. They tell also of various tricks that were practised upon him, in consequence of the loss of his memory, in a great degree, in the latter stage of his life.

It has been said that Mr. Simpson frequented low company, with whom he used to guzzle porter and gin; but it must be observed, that the misconduct of his family put it out of his power to keep the company of gentlemen, as well as to procure better liquor.

In the latter stage of his existence, when his life was in danger exercise and a proper regimen were prescribed to him, but to little purpose; for he sunk gradually into such a lowness of spirits, as often in a manner deprived him of his mental faculties, and at last rendered him incapable of performing his duty, or reading the letters of his friends; and so trifling an accident as the dropping of a tea-cup would flurry him as much as if a house had tumbled down,

The physicians advised his native air for his recovery; and in February, 1761, he set out, with much reluctance (believing he should never return) for Bosworth, along with some relations. The journey fatigued him to such a degree, that upon his arrival he betook himself to his chamber, where he grew continually worse and worse to the day of his death, which happened May 14th, in the fifty-first year of his age.

EAST INDIAN LAPIDARY'S WHEEL.

The following description is from the pen of M. L. de la Tour:—This

kind of Lapidary's Wheel is called, in the Tarmoule language, *courundum sane.* It is composed of corundum, more or less finely powdered, cemented together by lac resin; the proportion, by volume, is two-thirds powdered corundum, one-third lac resin. The corundum powder is put into an earthen vessel, and heated over a clear fire; when of a sufficient heat, which is the case when a small piece of the resin readily fuses, the resin is added in portions, stirring at the time to form an intimate mixture. When made into a paste, it is put on a smooth slab of stone, and kneaded by being beaten with a pestle; it is then rolled on a stick, repeated several times, continually kneading it until the mixture is perfectly uniform. It is then separated from the stick, laid again on the stone table, which has been previously covered with very fine corundum powder, and flattened into the form of a wheel by an iron rolling pin — The wheel is then polished by a plate of iron and corundum powder; and, finally, a hole is made through the middle, by a heated rod of copper or of iron. These wheels are made of a grain more or less fine;— the coarser perform the first rough work, and the finer cut the stones.— They are mounted on a horizontal axis, and the workman, sitting on the ground, makes them revolve with a spring bow, which he moves with his right hand, at the same time, with his left, holding the stone against the wheel; the latter being, from time to time, carefully moistened and powdered with corundum powder. The polish is given by wheels of lead and very fine corundum powder.

It is supposed that this kind of lapidary's wheel may be imitated with advantage in Europe; the powder of emerald or diamond being used in place of that of corundum.

NEW PIECE OF ARTILLERY.

A Report was read, at a late Meeting of the French Academy of Sciences on certain experiments made at Brest on the effects of a new kind of Artillery invented by a M. Paixham. The piece (*canon à bombes*) of which trial was made, had a bore eight inches in diameter. The object fired at was an old vessel of 80 guns. Each discharge caused such injury as would entirely have disabled it from continuing in action. The fire of the new piece, charged with ten pounds of powder, was much superior to that of a thirtr-six pounder, having a charge of twelve pounds of powder, at similar angles. The commission who witnessed the experiments were unanimous as to the advantages which would be produced by the adoption of this new piece of artillery in the defence of places, and in floating batteries placed at the entrance of harbours. They were also of opinion that, ultimately, they would be introduced on board vessels, without inconvenience, and thus have the effect of establishing a sort of equilibrium between vessels of different dimensions.

QUERE.

SIR,—I wish to be informed, through your interesting publication, the best method of making aromatic vinegar.

J. J. A.

Communications for the American Mechanics' Magazine,
Post paid, and addressed to
JAMES V. SEAMAN,
Broadway, New-York, will receive due attention.

William Van Norden, Printer.